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ABSTRACT

Households have different means to provide in their need for services. In general a household can produce a service itself, or buy it on a legal market or illegal market.

This article investigates the choices made by Dutch households with respect to three services: small home repairs, car repair and maintenance, and ladies hairdressing. The analysis showes that the most important determinants of choice are family-income, age and education of the bread-winner, degree of urbanization of the residence and a do-it-yourself inclination. These determinants especially influence the choice between legal market provision on the one hand and illegal market provision or home production on the other hand. The only determinant with a distinct discriminating effect between illegal market provision and home production of services is the do-it-yourself inclination of the household.

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1. INTRODUCTION

Most of the empirical research on household production- or home production as it is also called - is on a macro-economic level, using time budget data. (See for an overview: Hawrylyshyn, 1976 and for an example of a recent study: Schettkat, 1985). The literature gives only a few examples of micro-economic studies of household production (Gronau, 1980). Research focusses on changes in time spent on household activities. Increasing time spent at home indicates that market activities have become less important and vice versa. Thus conclusions are drawn about shifts between household production and the market sector.

These shifts are especially interesting with respect to services. Private services sold on the market have shown a fast growth in the past decades, strongly induced by the growth of private incomes. The growth of the service sector led some to belief in a coming post-industrial society (Bell, 1973). There is however an important counterforce: the unbalanced productivity growth. Because the rate of labour productivity growth is low in service sectors the price of services in relation to goods has risen and will continue to rise in the future. In combination with the availibility of ever improving consumer durables this may lead to an increasing home production (Gershuny, 1983) and a growth of illegal market provision by the so called hidden economy. On an illegal market services are sold at a price substantially lower than on the legal market. The price-reduction on the illegal market is achieved by means of tax evasion: no Value Added Tax, Income Tax or other taxes are paid.

Demand for services does not disappear but expensive private services are replaced by self service activities (- Toffler, 1980) and illegal market provision. At the moment market services and equivalent self-service activities go side by side and one may wonder if the shifts mentioned will ever be completed.

This article does not deal with changes in choices of households over time, but with differences in choice households make at a specific moment in time. The main question of this

article is: why do some households produce services themselves and do other households buy them on the market? Using data of about 2000 Dutch households choices are analysed with respect to small home repairs, car repair and maintenance, and ladies hair dressing. Some households produce these services themselves while others buy them on a legal or an illegal market.

This article is set up as follows. In section 2 the characteristics of household production and illegal market provision are briefly discussed. Also attention is given to the choices of households with respect to the modes of provision of their services from a theoretical point of view. In section 3 the data from the April 1985 Dutch household survey used in the analysis are described. In this survey households were questioned about their legal and illegal market provision of services and their do-it-yourself activities. In section 4 household choices are modelled. It is shown that the cost-minimizing behaviour of the households under certain assumptions leads to a multinomial logit model. In the logit model four alternatives are distinguished: legal market provision, illegal market provision, home production and a combination of legal market provision and home production. Furthermore the variables used in the analysis are discussed. The estimation results from the multinomial logit model and other results of the analysis are presented in section 5. The conclusions are drawn in section 6.

2. CHOICES OF HOUSEHOLDS

2.1 Household production and illegal market provision

The theory of household production integrates the theory of the consumer with that of the firm. Households are cost-minimizing and utility maximizing units. In Beckers' article a household is considered to be a small factory which 'combines capital goods, raw materials and labour to clean, feed, procreate and otherwise produce useful commodities', in short: households produce basic commodities combining time and market

goods (Becker, 1965).

According to the theory of household production, a household maximises a utility function - consisting of a vector of market goods and a vector of time inputs used in the production of the commodities - subject to a goods constraint as well as a time constraint. A household produces an optimal combination of commodities following a two stage optimization procedure. In the first stage short run costs of production are minimized subject to the budget and time constraint facing the household, which leads to a production possibility frontier. Given this production possibility frontier in the second stage the household chooses the combination of commodities that maximizes utility (Deaton and Muellbauer, 1983).

The two main features of the theory of household production are the incorporation of time as a major determinant of household choices and the separation of the consumption aspects from the production aspects of household behaviour (Gronau, 1986).

In recent years there has been a lot of discussion about the economic value of household production. The main topics in this discussion are twofold. The first concerns the definition of household production: which activities can be considered as productive and which not? The second topic is how the economic value of these productive activities can be calculated.

The discussion about the definition of household production is mostly about the distinction between work and leisure activities. According to Hawrylyshyn (1977) household production is restricted to those activities performed within the household by one of its members producing indirect utility and which could be done for pay by someone not belonging to the household. With these two elements - indirect utility and the ability of delegation - it is possible to draw a distinction between work and leisure, and work and biological needs. According to Hill (1979) an activity is productive if it can be performed by a unit distinct from the one who consumes the end result. So the essential criterium for a productive activity is the existence of a market alternative.

The second topic in the discussion on household production concerns the money value of it. Two approaches use time spent

on household production, a third approach uses the price of equivalent goods and services available on the market. In the forgone expense-approach the value of household production equals expenditures saved by performing household work oneself. In the forgone wage approach the value of household production equals the money income that would be earned if instead of spending time on unpaid household work work was done on the market for a wage. In the market approach the value of unpaid household labour equals the price of equivalent goods and services available on the market minus the value of intermediate consumption and fixed capital consumption (household durable equipment). Thus the net added value by unpaid household labour can be calculated (Chadeau, 1985).

So there are various methods to establish the value of household production. The problems with them are twofold: lack of adequate data and a wide range of outcomes depending on the method used. This means that although the economic significance of some household activities is no longer denied, empirical work based on the household production theory is scarce. The theory is mostly used as an analytical tool and only rarely as a guide-line in empirical studies (Gronau, 1986).

Illegal market provision of services is part of the so called hidden economy. There are many definitions and descriptions of this phenomenon. A useful one is where the hidden economy is defined as that part of the economy where hidden income is generated. Hidden income is income that is not reported to the tax office, or to the institutions responsible for the payment of social benifits, while there is a formal obligation to do so. Part of the hidden income is generated by hidden labour. There are two main types of hidden labour (Van Eck and Kazemier, 1988):

- Independent hidden labour, which involves the informal paid activities by individuals for other individuals. Such activities include hairdressing, domestic service, removals, plumbing, painting and car repair. People involved in autonomous hidden labour will often have as their customers, relatives, friends, neighbours and other acquaintances.
- Hidden labour involving enterprises, which includes work of

individuals for enterprises. This work may be done with or without a formal labour contract. Examples of the first sub category are unreported overtime or other partial registration of the working time of a formally registered employee. Examples of the second subcategory are home work, recruited labour in construction, peak time assistance in the retail trade or in cafes and restaurants.

Illegal market provision of services relies of course on independent hidden labour. So the illegal market for services is only a small part of the hidden economy. There are mainly two reasons why consumers rely on illegal markets rather than on legal markets: costs and time (Lambooy and Renooy, 1985). Services from the illegal market are cheaper than those from the legal market. Illegal provided services are especially those which have gone up in price rapidly, because of the labour-intensive character of the production. High income taxes, social premiums and value added taxes which have to be paid on the legal market are evaded on the illegal market, which reduces the prices substantially. Time also influences the use of illegal markets. The use of legal markets is often restricted to 'office hours'. For people with a job this can be problematic, because their working time coincides to a large extent with the time in which they have to use legal market services. This may urge people to search for supply of services on off-office hours like evenings or saturdays. The illegal market is excellently capable to supply these services, because hidden labour is not restricted to specific working-hours.

Generally research of the hidden economy is not easy. One of the main problems is the illegal nature of the transactions. People often are not willing to share information about illegal activities with an interviewer. In the case of illegal market services however this may be a smaller problem because the user of illegal services is not punishable by law.

2.2 A theory for the provision of services

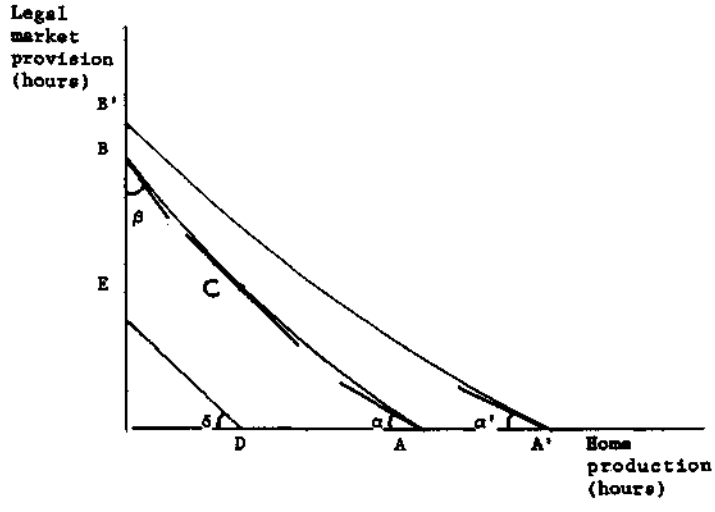
In the traditional household production model a household chooses an optimal combination of time and goods to produce

commodities. The result of the optimization process is a large number of commodities for the household to consume. In this article the choice of a household with respect to a specific service is analysed. A household is in need of a service and is confronted with the choice between buying a service or producing it itself.

Let us consider this choice by means of figure 1, which deals with the choice between home production and legal market provision, as if there is no illegal market. Figure 1 specifies legal market provision and home production in number of hours, we abstract from cost of materials and equipment used in the production process. The convex curve AB represents an isoquant, so it consists of combinations of hours of legal market provision and hours of household production with which the household gets an equal volume of a service of a specific kind, for example a service in car repair and maintenance. The curve AB represents the technical rate of substitution, the rate at which home production hours can be substituted for market production hours while maintaining a constant level of service production.

The extremes on the isoquant are A and B. In A the household does the job completely itself, using OA hours. In B the household completely relies on a garage, which needs OB hours to do

Figure 1 The choice between legal market provision and home production



the same job. On the other points of the isoquant the household does some parts of the repair itself and uses the services of a garage for the rest.

The line DE with slope δ_1 represents a constant-cost curve of the household showing the equal cost combinations of legal market provision and household production resulting in a certain amount of the service in question. Of course δ_1 is equal to the ratio of the hour costs:

$$\delta_1 = \frac{c_H}{c_L} \qquad [1]$$

in which: c_H = the costs of household production per hour

c_L = the costs of legal market provision per hour, for example an hour-rate paid to a garage

The hour-costs of household production depend on the value the household attaches to the time. This value may depend on the net market wage-rate of the member of the household which carries out the household production but will also depend on the pleasure or aversion connected with the job. The constant-cost curve DE represents the economic rate of substitution, the rate at which home production hours can be substituted for legal market production hours while maintaining constant costs.

If the volume of the required service is fixed, the problem of the household is to find a cost-minimizing point on the isoquant. To minimize the costs the household chooses the combination of household production and legal market provision corresponding to the point where the technical rate of substitution equals the economic rate of substitution, which is the point at which the isocost-curve is tangent to the isoquant curve. In figure 1 this is point C.

In many cases the situation in figure 1 will not lead to an interior solution but to a boundary solution. If $\delta \leq \alpha$ A is the optimum; if $\delta \geq \beta$ B is the optimum. Only when $\alpha < \delta < \beta$ combinations of household production and legal market provision are used to produce the service. If isoquant AB is linear,

there is always a boundary solution unless the slope of the constant-cost curve equals that of the isoquant, in which case there is no specific optimum.

In general the constant-cost curve is fixed for a household. Garages have an hour-tariff c_L for their services, regardless of the kind of car services they render. The costs of household production are constant unless the household changes the value of time. The isoquant however depends on the scale or the intricacy of the service in question. Legal market production has economies of scale which household production has not. For difficult jobs a household - lacking the sophisticated capital goods of the garage - needs relatively more time than the garage needs. For difficult jobs the isoquant becomes for example A'B' with slope α' at A'. Because $\alpha' < \alpha$ difficult jobs have a smaller probability to be home produced and a larger probability to be provided by the legal market. This means that there are households which rely on the garage for some car repair and maintenance while they produce other more simple of these services themselves.

It is also clear from figure 1 that a rise in garage tariffs will lead to more home production. An increase in income of the household will lead to more legal market provision, because the costs of home production increase. The difference between legal market costs c_L and net income of the household is influenced by the tax rate. When the tax rate increases there is a shift in the choice of the household from legal market provision to home production.

As stated before two kinds of market can be distinguished: a legal and an illegal market. The same story as for the choice between household production and legal market provision holds for the choice between legal and illegal market provision and can be illustrated in figure 1 replacing home production for illegal market provision. The isoquant AB then gives the combinations of legal and illegal market provision the household uses to acquire a certain volume of a service of a specific kind. The slope δ_2 of the constant-cost curve of legal and illegal market provision is equal to ratio of the hour-costs:

$$\delta_2 = \frac{c_I}{c_L} \qquad [2]$$

in which: c_I = the hour-costs of illegal market provision, for example an hour-rate paid to an illegal jobber plus a fictitious price for the moral burden of using an illegal market

The price of illegal market provision includes a fictitious price for the moral burden connected to this kind of provision. Like household production the illegal production also lacks the sophisticated capital goods of the legal sector. Illegal production may have economies of scale, but they are smaller than the economies of scale of legal production. More difficult jobs thus have a larger probability to be provided by the legal market. The major difference between the legal and the illegal market price of the service is the tax which is included in the legal and excluded in the illegal market price. An increase in the tax rate will thus lead to a growth of the illegal market. A change in public opinion will also influence the illegal market price by means of the fictitious price for the moral burden in question. When illegal provision is more easily accepted by the public as a common phenomenon the illegal market price will decrease and there will be a shift from legal to illegal market provision.

The choice to make which households face is three dimensional. A household can choose between home production, legal market provision and illegal market provision as well as all the combinations between these three. Which choice it will make depends on a great number of determinants: the socio-economic position and the preferences of the household, the skills and physical conditions of the members of the household, the tools they possess, the availability of illegal market services, etcetera.

3. DATA

The data used in the empirical analysis are from an April 1985 survey in which about 2000 households were asked about their provision of goods and services. In this article we use information about three services: small home repairs, car repair and maintenance, ladies hair dressing. (See for details of the survey: Van Ours, Kunnen and De Voogd, 1986 and Van Ours, Gerritsen, 1988). For a given period of time preceding the interview households were asked whether or not they consumed one or more of these services. The reference period for small home repairs and car repair and maintenance was 6 months, for ladies hair dressing it was 1 month. If the household used a service it was asked about the way it provided for this service: by home production or by buying on a legal or illegal market.

The question of whether or not there was home production was formulated by asking if the respondent or one of the other members of the household produced the service. It is difficult to make a distinction between services provided by the legal or illegal market. It is not always clear to consumers wether or not they buy the service on an illegal market. There are two situations in which one may speak of illegal market provision. The first situation is when the consumer does not pay Value Added Tax where - according to the law - there should have been. The second situation is when the producer of the service does not pay income taxes or other taxes and therefore is able to reduce his price. In the first situation there is a big chance the consumer realises the fact the service provision is from an illegal market. In the second situation there is practically no chance the consumer realises the fact the provision is illegal. Even if the consumer recognises illegal market provision as such there is a possibility of evasive behavior of the respondent: he or she denies the fact that the household bought the service on an illegal market. Therefore in the survey there were no direct questions referring to illegal character of the service provision. In the questions the distinction was made between paid services of firms distinct from paid services from a person which was described as a

jobber. In this way there is a big chance to locate illegal market provision, though we admit there is an arbitrary element in this.

Of course not every question was posed to every household. The questions about car repair and maintenance were restricted to households in the possession of one or more cars. The questions about ladies hairdressing were restricted to households with one or more females aged 15 years and older.

The questions were posed as follows:

Small home repairs

The first question was whether or not in the past six months there were small home repairs, described as repairs of water taps, water-pipes, waste-pipes, power-points etcetera. It was called household production if it was done by the person questioned, one of the other members of the household or with the help of or by friends or relatives as long as it was done unpaid. The small home repairs were considered as bought on an illegal market if they were paid for and done by some-one else for example a jobber. It was called legal market provision if it was done by an offical firm.

Car repair and maintenance

The first question was whether or not in the past six months one or more cars of the household were repaired or maintained. This was called home production if it was done by the person questioned, one of the other members of the household or by friends or relatives, as long as it was done unpaid. The car repair and maintenance was considered as bought on an illegal market if it was paid for and done by some-one else, a mechanic or a jobber. It was called legal market provision if it was done by a garage.

Ladies hair dressing

The first question was whether or not the hair of one or more of the females in the household was dressed in the month March 1985. It was called household production if this was done by the person questioned, one of the members of the household, or by friends or relatives. The latter only if it was done unpaid. The hairdressing was considered as bought on an illegal market if it was paid for and done by a so-called home-barber. The hairdressing was called legal market provision if it was done

at a barbershop.

We have no information about the number of times a household used a service in the reference period: we only know whether or not a service was used. Because we used a reference periode for asking back, combinations of modes of provision are possible. If a household uses different modes of provision in the reference period we cannot make a distinction between the cases in which in the reference period the household used two or more services on different occasions, choosing different modes of provision depending on the scale of the service, and the case in which the household used only one service but in a combination of two (or more) modes of provision. For example: we cannot make a distinction between the case in which a household had a car repair by an offical garage one month and by one of the members of the household - maybe because it was only a small repair - a month later and the case in which the car was repaired by an offical garage in combination with some small repairs by one of the members of the household. The implications of this are discussed in section 4.1.

Starting from three separate modes of provision we have seven possible ways in which a household can provide for services in a certain period of time.

Table 1 Choices of households (percentages)[a)]

	Choice in mode of provision (%)								Total
	L	H	I	LH	LI	HI	LHI	Total	(numbers)
Small home repairs	19	66	4	7	1	2	1	100	580[b)]
Car repair/maintenance	54	20	8	11	3	3	1	100	1116[c)]
Ladies hair dresssing	54	12	13	16	1	3	1	100	915[d)]

a) L=legal market provision; H=home production; I=illegal market provision
b) Total number of households in the sample: 2126
c) Only households in the possession of one or more cars; total in the sample: 1531
d) Only households with one or more females of age 15 years and older; total in the sample: 1546

From table 1 it appears that 27% of the households had small home repairs, 73% of the households with one or more cars used a car repair and maintenance service, while 59% of the households with one or more females of age 15 years and older used a ladies hair dressing service.

Table 1 also contains information about the choices the household made with respect to the services in question. From this table we see that small home repairs are mostly done by home production, whereas car repair and maintenance and ladies hair dressing are mostly provided for by legal market provision. Illegal market provision is rather large for ladies hair dressing. The combination of home production and legal market provision is also used by many households. The other four possible combinations are rarely used.

Because the combinations of legal + illegal market provision, as well as home production + illegal market provision and the combination of the three possible modes of provision are rarely used, they were skipped from the analysis. In the analysis four modes of provision are distinguished: legal market provision, home production, illegal market provision and the combination of legal market provision and home production.

After discarding households with combinations of modes of provision not analysed and discarding households for which essential variables were missing the following samples remained: 426 households consuming small home repair services, 846 households consuming car repair and maintenance services and 665 households consuming ladies hair dressing services.

4. ANALYSIS

4.1 Modelling household choices

According to table 1 four alternatives were used regularely by households to provide for their services: home production (H), legal market provision (L), illegal market provision (I) and the combination of legal market provision and home production (LH). The theory presented in section 2.2 suggests that these choices indicate that the isoquants are

linear or almost linear combinations of the different modes of provision. If this is the case the choice of a household is determined by the ratio's of the hour costs and the slopes of the isoquants, which themselves depend on the scale of the service in question.

As was discussed in section 3 our data do not contain information about the number of times and the amounts at which the different modes of provision for the services where used. We only know whether or not a mode of provision was used in a specific time interval.

Using a discrete choice model to analyse these choices is possible if we consider the combination LH to be a single discrete choice and not a combination of two discrete choices. In the same way the multinomial logit model is derivable from utility maximization (Domencich and McFadden, 1975; Amemiya, 1981) it is derivable from cost minimization.

We assume for a household i the costs associated with each of the four alternatives are given by:

$$C_{ij} = \mu_{ij} + v_{ij} \qquad [3]$$

with: j = H, L, I or LH

where μ_{ij} is a nonstochastic function of explanatory variables and unknown parameters and v_{ij} is an unobservable random variable, independent from alternative to alternative. We assume that the household chooses the alternative for which the associated cost are lowest. So the probability home production is choosen is (suppressing the subscript i):

$$P(H) = P(C_H < C_L,\ C_H < C_I,\ C_H < C_{LH})$$

$$= P(v_H+\mu_H-\mu_L < v_L,\ v_H+\mu_H-\mu_I < v_I,\ v_H+\mu_H-\mu_{LH} < v_{LH}) \qquad [4]$$

Assuming the probability density function of v_j is the Weibull $f(v_j) = \exp(v_j).\exp(-\exp(v_j))$ it follows from [4]:

$$P(H) = \int_{-\infty}^{\infty} e^{v_H} \cdot \exp(-e^{v_H}) \cdot \exp(-e^{v_H+\mu_H-\mu_L}) \cdot \exp(-e^{v_H+\mu_H-\mu_I}) \cdot \exp(-e^{v_H+\mu_H-\mu_{LH}}) \, d\, v_H \qquad [5]$$

which becomes:

$$P(H) = \frac{\exp(-\mu_H)}{\exp(-\mu_H) + \exp(-\mu_L) + \exp(-\mu_I) + \exp(-\mu_{LH})} \qquad [6]$$

the multinomial logit model with 4 alternatives, in which the μ's are linear functions of explanatory variables:

$$P(H) = \frac{\exp(X'\beta_H)}{\exp(X'\beta_H) + \exp(X'\beta_L) + \exp(X'\beta_I) + \exp(X'\beta_{LH})} \qquad [7]$$

It is possible that the choice LH consists of two discrete choices L and H done by the same household in the reference period, because it was confronted with the need to make a choice for services of a different scale. So the choice LH may represent a discrete choice LH, two discrete choices L and H or even a combination of discrete choices LH, L and H. The coefficients β_{LH} may thus represent a mixture of different effects.

4.2 Variables

In the analysis different explanatory variables are used. Most of them are obvious from a theoretical point of view, though especially of the influence of some of the variables on illegal market provision we have no expectations based on theoretical insights. The explanatory variables are the following:

Net family-income: Theory predicts the higher the income of the household the higher the value of time and thus the larger the probability of legal market provision and the smaller the probability of home production. The consumption possibilities

of a household are to a large extent determined by the net family-income. If illegal market provision is used as a means to save money a negative relation between income and illegal market provision is expected. We expect the higher the income the larger legal market provision and the smaller home production and illegal market provision.

Family size: Another determinant of the consumption possibities of the household is the family size: the larger the household the smaller family income per person. We expect larger households to compensate for this by saving money and using more home production and illegal market provision to provide for their services.

Age: Whether a household is able or unable to home production depends amongst others on the physical condition of the members of the household. Physical conditions decrease with age, so older persons have a smaller ability to carry out home production. The illegal market has probably grown especially during the last decades. Older persons are less accustomed to this phenomenon, have larger moral objections, so we expect a negative relation between age and illegal market provision.

Education: In the legal sector a higher education is connected to a higher productivity. Whether this relation holds for home production is doubtful. There is no reason to assume a university graduate has a greater productivity in repairing a car than a person with a secondary level education. The same holds for the choice between legal an illegal market provision, so we don't have expectations about the relation between education and choice in mode of provision.

Work: In the dataset we used there is unfortunately no information about the available free time of the households. We asume that if one of more members of the household had paid work there was less time available for home production. We therefore expect a negative relation between work and home production. Using services from a legal market is in many cases restricted to office-hours. Especially for people with a job this can cause difficulties, because they have to consume these services in working hours. In the illegal sector there is more flexibility in this, because illegal labour is not restricted to office-hours. We therefore expect a positive relation

between work and illegal market provision.

Residence: The place of residence of the household may be an important determinant of the choice of mode of provision of the services, because of the availability of service-networks. In rural areas for example the supply of legal and illegal market services will be less abundant than in a city. So we expect a positive relation between urbanization and legal as well as illegal market services. Lacking the abundant supply of services in an urbanizised region in rural areas households will have to rely more on home production.

Do-it-yourself attitude: Whether or not a household can carry out home production depends for many services on the availability of suitable tools. Households who seldom practice do-it-yourself activities have a great possibility of not possessing these tools. But households who possess these tools still have the opportunity for legal and illegal market provision. We consider the possession of suitable do-it-yourself tools as an indicator for a self-service inclination of the household and expect a positive effect of this on home production.

There are two specific explanatory variables, the influence of which will be restricted to only one of the services:

Possessing a house distinct from renting one may influence the choice of the household with respect to small home repairs though we have no theoretical or other indication of the direction of this influence.

Possession of more than one car distinct from possession of just one car may influence the choice of the household with respect to car repair and maintenance, but again we have no a priori-expectations of the direction of this influence.

The definitions of the variables are shown in Appendix 1, an overview of the means of the variables used in the analysis is given in Appendix 2.

5. ESTIMATION RESULTS

For the estimations we used the multinomial logit program LOGITJD. There are different possibilities to present results of multinomial logit analyses. We use the derivates:

$$\frac{\delta P_j}{\delta X_k} = P_j \left(\beta_{kj} - \sum_{t=1}^{S} \beta_{kt} . P_t \right) \qquad [8]$$

with: X_k = explanatory variable
j = alternative: L,H,I,LH
S = the total number of alternatives

and calculated them in the sample-averages. Because the probabilities add up to 1 the derivates add up to 0:

$$\sum_{t=1}^{S} \frac{\delta P_t}{\delta X_k} = 0 \qquad [9]$$

the influence of the different explanatory variables on shifts between alternatives can be derived directly from the estimation results, presented in table 2.

From table 2 it appears that the choices with respect to small home repairs are not influenced by family-income, family-size and urbanization-dummies. There is some influence of age, education and work. The strongest influence comes from the do-it-yourself inclination and the possession of the house dummy. Household with a do-it-yourself inclination do more themselves and use less legal as well as illegal market services. The ownership of a house influences the choice between legal market provision and home production. Households owning a house do more themselves.

The choice with respect to car repair and maintenance is influenced by many variables. The only variable with no significant influence is family-size. Households with a larger family-income use more legal market provision for their car repair and maintenance and less home production as well as illegal market provision. The same holds for households with a higher age bread-winner. Level of education and paid working

Table 2 Estimation results multinomial logit model; derivates of probabilities at sample averages

a. Small home repairs

	LEGAL	HOME	ILLEGAL	HOME+LEGAL
INCO	0.12 (1.6)	-0.08 (0.9)	0.00 (0.1)	-0.04 (0.8)
SIZE	0.01 (0.7)	-0.01 (0.3)	0.00 (0.4)	-0.00 (0.7)
AGE	0.03 (1.6)	-0.04 (1.7)*	0.01 (1.6)	0.00 (0.4)
EDUC	0.02 (0.7)	-0.04 (1.5)	0.00 (0.1)	0.02 (1.8)*
WORK	-0.12 (2.0)**	0.12 (1.5)	0.01 (0.4)	-0.01 (0.1)
URB1	-0.12 (1.5)	0.11 (1.2)	-0.00 (0.3)	0.01 (0.1)
URB2	-0.01 (0.1)	0.05 (0.6)	-0.03 (1.2)	-0.01 (0.1)
URB3	-0.05 (0.9)	0.10 (1.4)	-0.04 (1.6)	-0.01 (0.2)
DIYD	-0.23 (5.3)**	0.30 (5.9)**	-0.06 (2.7)**	-0.01 (0.5)
HOME	-0.15 (3.2)**	0.17 (3.2)**	-0.01 (0.5	-0.01 (0.4)

-Loglikelihood = 329.1 -Loglikelihood baseline = 369.4

b. Car repair and maintenance

	LEGAL	HOME	ILLEGAL	HOME+LEGAL
INCO	0.35 (4.6)**	-0.28 (4.1)**	-0.09 (2.1)**	0.02 (0.3)
SIZE	-0.03 (1.5)	0.02 (1.2)	0.01 (1.1)	-0.00 (0.2)
AGE	0.14 (6.9)**	-0.10 (5.9)**	-0.02 (1.4)	-0.02 (1.5)
EDUC	0.05 (2.6)**	-0.06 (3.0)**	-0.01 (0.9)	0.02 (1.4)
WORK	0.11 (1.6)	-0.16 (2.6)**	0.01 (0.1)	0.04 (0.8)
URB1	-0.14 (2.1)**	0.02 (0.4)	0.07 (1.9)*	0.05 (1.2)
URB2	-0.18 (3.3)**	0.07 (1.7)	0.07 (2.1)**	0.04 (1.1)
URB3	-0.10 (1.9)*	-0.00 (0.1)	0.06 (1.9)*	0.04 (1.3)
DIYD	-0.17 (4.3)**	0.16 (4.7)**	-0.05 (2.4)**	0.06 (2.2)**
CAR	-0.20 (3.3)**	0.06 (1.2)	0.04 (1.4)	0.10 (3.1)**

-Loglikelihood = 861.6 -Loglikelihood baseline = 962.5

c. Ladies hair dressing

	LEGAL	HOME	ILLEGAL	HOME+LEGAL
INCO	0.22 (3.1)**	-0.09 (1.8)*	-0.09 (1.8)*	-0.04 (0.7)
SIZE	-0.02 (0.9)	-0.02 (1.2)	0.02 (1.8)*	0.02 (0.8)
AGE	-0.03 (1.6)	-0.01 (0.6)	-0.02 (1.6)	0.06 (4.0)**
EDUC	0.04 (1.7)*	-0.02 (1.1)	-0.02 (1.3)	0.00 (0.0)
WORK	-0.07 (1.0)	0.01 (0.3)	0.04 (0.8)	0.02 (0.4)
URB1	-0.11 (1.5)	0.11 (2.6)**	0.03 (0.4)	-0.03 (0.4)
URB2	-0.15 (2.6)**	0.00 (0.0)	0.12 (2.7)**	0.03 (0.8)
URB3	-0.12 (2.0)**	-0.00 (0.0)	0.09 (2.1)**	0.02 (0.6)
DIYD	-0.02 (0.4)	0.04 (1.6)	-0.04 (1.7)*	0.02 (0.8)

-Loglikelihood = 715.9 -Loglikelihood baseline = 758.4

t-values between parenthesis
** Significant at 5%-level * Significant at 10%-level

discriminate between legal market provision and home production. High education of the bread-winner and having one or more members of the household on a paid job means less home production. The degree of urbanization of the residence appears to influence the choice between legal market and illegal market provision. Households in rural areas have a smaller illegal market provision than households in small or large cities. As was expected a do-it-yourself inclination of the household stimulates home production at the cost of legal market as well as illegal market provision. Households with more than one car use more often than households with one car home production in addition to legal market provision.

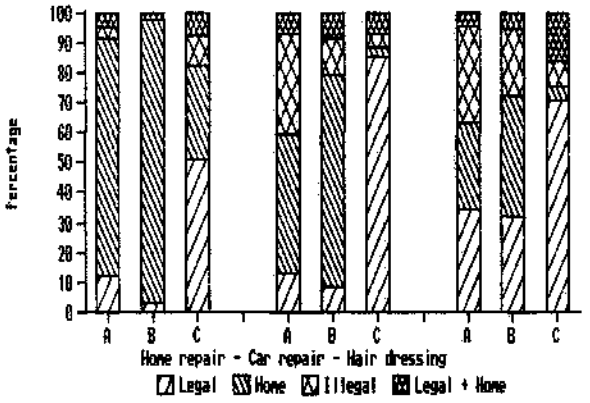
The choices of households with respect to ladies hair dressing are especially influenced by family-income, age of the bread-winner and degree of urbanization of the residence of the household. A high family-income increases legal market provision at the cost of home production and illegal market provision. A high age of the bread-winner stimulates the combination of legal market provision and home production at the expense of the other alternatives. Households in the country use more legal market services and less illegal market services than households in small and large cities. If the household lives in Amsterdam, Rotterdam or The Hague and suburbs home production is prefered. Furthermore small influences are visible from other variables like family-size, education of the bread-winner, and the do-it-yourself inclination. The latter variable stimulates home production at the expense of illegal market provision.

To illustrate the effect of the most important determinants on the choices households make, we constructed three types of households and used the results from table 2 to calculate the choices they would make. The three types of households differ in family-income, age and education of the bread-winner, degree of urbanization and do-it-yourself inclination. Households A and B are low-income households with a young and low educated bread-winner living in one of the three big cities in the Netherlands. Household B has a do-it-yourself inclination which household A has not. Comparing households A and B gives the effect of the do-it-yourself inclination.

Household C has a high income and a middle-aged, high educated bread-winner living in the country without a do-it-yourself inclination.

The calculated choices are presented in figure 2. From this figure it appears that household C has a strong preference for legal market provision, while for households A and B legal market provision is much less important. As far as legal market provision is concerned there is not much difference between the choices of households A and B. Household B has a preference for home production while household A finds compensation for the smaller legal market provision by consuming more services from the illegal market.

Figure 2 Calculated choices for three characteristic households



Households (see also: Appendix 1)	A	B	C
Net family income (gld/month)	2000	2000	4000
Age bread-winner (years)	25	25	50
Education bread-winner (CBS-code)	2	2	5
Urbanization dummy URB1	1	1	0
Do-it-yourself dummy	0	1	0

Households facing the need for a service seem to choose between legal market provision on the one hand and illegal market provision and home production on the other hand, a choice which is especially determined by family-income, age and education. Households who have less monetary restrictions on their consumption budgets, who are older and thus less able to carry out household production and have a stronger moral

objection against illegal market provision and households with a higher education have a preference for legal market provision. The choice between home production and illegal market services depends on the do-it-yourself inclination of the household and the availability of illegal market service-networks. The latter reveals itself because of the stronger preference for illegal market provision of households living in urbanized areas.

6. CONCLUSIONS

Households have different means to provide in their need for services. In general a household can buy a service on a legal market market, an illegal market or produce it itself. The choices of households to acquire services in a certain way do not only have micro-economic consequences regarding the allocation of the financial budgets of those households. They also contribute to the rise or decline of certain service sectors, legal as well as illegal.

In this article the choices of Dutch households have been analysed with respect to three services: small home repairs, car repair and maintenance and ladies hairdressing. With three single modes of provision and four combinations of these three there are seven possible ways in which a household can provide for a service. From the survey it appears that only four alternatives are use regularely: home production, legal market provision, illegal market provision and a combination of home production and legal market provision. According to the theory of the cost-minimizing household these choices indicate that the isoquants of the modes of provision are linear or almost linear.

The analysis was carried out using a discrete choice model for which we used a multinomial logit model with the four alternatives mentioned above. The analysis showes that the most important determinants of choice are family-income, age and education of the bread-winner, degree of urbanization of the residence and a do-it-yourself inclination. A high family-

income and a high education of the main earner have a positive effect on legal market provision and a negative effect on illegal market provision and home production. Households in rural areas use more services from a legal market and less from an illegal market. A high age has a positive effect on legal market provision and a negative effect on home production. The influence of age on illegal market provision depends on the service in question. For small home repairs illegal market provision increases with age, though the effect is small. In the other categories illegal market provision decreases with age. The only determinant with a distinct discriminating effect between illegal market provision and home production of services is the do-it-yourself inclination.

The main conclusion of this study is that the choices households make with respect to the mode of provision of the services they consume is influenced not only by financial arguments, but also by the physical condition of the members of the household, their skills, the supply of illegal market services in the local area, moral objections against the use of illegal market services and the inclination of the household towards selfservice-activities. More specific conclusions refer to the pattern we revealed in the choices of the households. It appears that households choose between legal market provision on the one hand and illegal market provision or home production on the other hand, a choice especially determined by socio-economic factors. If households don't buy on a legal market their choice between home production and illegal market provision depends on their selfservice inclination and the availability of illegal service-networks in their neighbourhood.

Exaggerating one could say home production is the domain of the low budget households, while services from an illegal market are bought by low-budget households unable to carry out home production.

Appendix 1 Definition of variables

INCO: Logarithm of net family income per month (in guilders)

SIZE: Family size

AGE: Age of the bread-winner (years/10)

EDUC: Education of the bread-winner (according to the Standard Education Classification of the Central Bureau of Statistics; 2 = primary level; 3 = extended primary level; 4 = secondary level; 5= higher vocational level; 6 = academic level

WORK: WORK=1 if one or more members of the household has a paid job; WORK=0 otherwise

URB1: URB1=1 if the household lives in Amsterdam, Rotterdam or The Hague and suburbs; URB1=0 otherwise

URB2: URB2=1 if the household lives in a large town; URB2=0 otherwise

URB3: URB3=1 if the household lives in a small town; URB3=0 otherwise

DIYD: Do-it-yourself dummy; DIYD=1 if the household is in possession of 4 or more out of the following 5 tools:soldering iron, tool box, volt-meter, electric drill, mitre-saw

HOME: HOME=1 if the household owns the house which it lives in; HOME=0 if the household rents that house

CAR: CAR=1 if the household owns 2 or more cars; CAR=0 if the household owns 1 car

Appendix 2 Means of variables used in the analysis

2.1 SMALL HOME REPAIRS

	Total sample	Legal	Home	Illegal	Home+Legal
INCO	7.88	7.94	7.87	7.87	7.89
SIZE	3.29	3.14	3.35	3.25	3.13
AGE	4.39	4.81	4.27	4.81	4.21
EDUC	3.52	3.62	3.45	3.56	3.84
WORK	0.79	0.66	0.82	0.75	0.81
URB1	0.13	0.12	0.12	0.25	0.16
URB2	0.34	0.38	0.34	0.25	0.32
URB3	0.32	0.31	0.33	0.19	0.32
DIYD	0.64	0.39	0.73	0.31	0.58
HOME	0.55	0.43	0.59	0.50	0.51
NUMBER OF OBSERVATIONS	426	77	302	16	31

2.2 CAR REPAIR AND MAINTENANCE

	Total sample	Legal	Home	Illegal	Home+Legal
INCO	7.91	7.97	7.78	7.83	7.96
SIZE	3.24	3.14	3.36	3.40	3.30
AGE	4.28	4.56	3.85	4.03	4.00
EDUC	3.49	3.59	3.20	3.31	3.72
WORK	0.83	0.78	0.85	0.86	0.91
URB1	0.12	0.12	0.09	0.14	0.13
URB2	0.33	0.31	0.36	0.35	0.35
URB3	0.34	0.34	0.30	0.38	0.36
DIYD	0.60	0.53	0.75	0.48	0.73
CAR	0.13	0.11	0.11	0.14	0.25
NUMBER OF OBSERVATIONS	846	471	195	74	106

2.3 LADIES HAIR DRESSING

	Total sample	Legal	Home	Illegal	Home+Legal
INCO	7.89	7.93	7.79	7.80	7.87
SIZE	3.21	3.18	3.10	3.47	3.18
AGE	4.50	4.41	4.45	4.19	5.07
EDUC	3.39	3.52	3.18	3.20	3.26
WORK	0.78	0.79	0.77	0.85	0.67
URB1	0.14	0.14	0.26	0.08	0.11
URB2	0.33	0.31	0.28	0.41	0.39
URB3	0.33	0.33	0.29	0.37	0.34
DIYD	0.56	0.55	0.63	0.50	0.60
NUMBER OF OBSERVATIONS	665	384	76	94	111

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